It is in connection with the planting of new ground, which will be one of the main duties of the Forestry Authority, that a well-planned and necessarily costly scheme of research and investigation is necessary. Lord Clinton, a member of the Interim Forest Authority, stated recently at Exeter that no farms would be taken to increase the woodland area. The new land to be acquired for planting must thus be restricted to lowland heaths and poor mountain pasture. The successful planting of such ground is a difficult problem if it is to be done at a reasonable cost. Research on new lines is imperative. The services of the best men in plant ecology, soil geology, botany, dendrology, etc., must be enlisted, and a proper team gathered together, in order to study the conditions which militate in this class of ground against tree growth, such as acidity of the soil, exposure to wind, etc. Arrangements must also be made for the selection of seed from the best sources.

Foresters in this country now rely on Pacific Coast conifers for the rapid production of timber in great quantity and of good quality. The Douglas fir and Sitka spruce are the main species employed, and so far these wonderful trees have been successful. *Thuya gigantea,* equally lauded and in many places already planted on a considerable scale, has suddenly been attacked by a fungus which threatens the extinction of this species. This untoward event may act as a warning against Lord Ancaster's view that it is only necessary to dig holes and plant trees. Much more knowledge is required of exotic species in regard to their adjustability to the new environment to which they are exposed in this country.

As to the replanting of the vast woodland areas felled during the war, the Forestry Bill appears to adopt the policy of the Report of the Forestry Sub-Committee of the Ministry of Reconstruction, which practically advocated the immediate purchase and planting of new land on a large scale, while it neglected to deal in a satisfactory manner with the question of replanting. The authors of the Forestry Bill, like the framers of the Report, apparently do not wish to antagonise the landowners by providing for compulsory replanting. This, it seems to us, is a needless fear on their part, as all wise landowners will replant. The argument in favour of compulsory replanting is simple. The Reconstruction Sub-Committee concedes the principle that afforestation is essential to national safety, and consequently should be carried out regardless of cost. It is not too much then to ask the landowners, who during the war sold their timber at an increased price, to replant the denuded areas. This they are morally bound to do on patriotic grounds. It is, moreover, the only way of utilising economically the denuded areas. A compulsory replanting clause should be introduced into the Bill. It will be a very easy measure to carry out, as it is analogous to compulsory tillage schemes, which have been very successful. To sum up, it is the business of the Forestry Authority to concentrate during the first five years on replanting, and to proceed cautiously with schemes for afforestation of poor land —the only kind that will be available.

We owe to Lord Lovat's strenuous advocacy the principle adopted in the Bill of a single Forest Authority for the United Kingdom, independent of all control, and subject to no interference from the existing Boards of Agriculture of England and Scotland and the Department of Agriculture for Ireland. Against this principle there is the Haldane policy that forestry should be developed in close association with agriculture both in administration and in the practical working out of schemes for buying suitable land for planting. The main point of view of Lord Lovat's policy as embodied in the Bill is to secure supplies of timber in the country in the interests of national safety, and no regard is to be paid to cost. Forests are a national necessity, and the country must have them, even though the money expended yields less than the current rate of interest on the capital involved. We are in favour of the Bill, which aims at an important national work that has been too long delayed, and for neglect of which in the past we suffered much in pocket during the war. It is devoutly to be hoped, however, that now the Bill is in Committee of the House of Commons the scientific and practical aspects to which we have directed attention will be improved for the sake of ensuring efficiency in this important national enterprise. Great praise should be given to the earnest efforts of Lord Lovat and his coadjutors in preparing the valuable Reconstruction Report, on the basis of which the measure is founded. That they have succeeded in inducing the Government to take up afforestation seriously is due to their energy, and augurs well for their success in carrying out afforestation in this country once the Bill becomes an Act.

HYDROGEN IN WAR AND INDUSTRY.

The Chemistry and Manufacture of Hydrogen. By Major P. Litherland Teed. Pp. vii + 152. (London: Edward Arnold, 1919.) Price 10*s*. 6*d*. net.

ONE of the most characteristic phases of modern industrial chemistry is to be seen in the extraordinary and unlooked-for development in the application to utilitarian purposes of the substances collectively known as the gases.

A few decades ago the majority of these bodies then known were regarded in the light of "chemical curiosities" rather than as potentially useful products. They were interesting to the student on account of their theoretical significance, but had little practical value. The present generation has seen all this changed. There is scarcely one of the commoner gases and few even of the rarer ones that have not been turned to a useful account. It is unnecessary to multiply instances of this fact. The examples of oxygen, nitrogen, chlorine, carbonic acid, nitrous oxide, ammonia, acetylene, ethylene, and methane are familiar enough to everybody. Others might be named. And the process goes on. When argon was discovered it seemed inconceivable, from the very nature of its inertness, that it could be of any practical use. But now argon is being extracted from the atmosphere on a manufacturing scale and applied in the electric lighting industry. Attempts are being made to utilise helium, and it is only the extremely limited supply which prevents the application of its extraordinary properties on the large scale. We may yet live to see the widespread use of niton as a therapeutic agent. In fact, he would be rash who would attempt to set any limit to the possible utilitarian application of a chemical product. History teems with examples which should warn us of the unwisdom of indulging in any such restriction.

Among the several gases which have of late years received an extraordinary development of application is hydrogen—the subject of Major Litherland Teed's little book. Although one of the earliest of the gases to have its individuality clearly recognised—namely, by Cavendish, who in 1766 made an approximately accurate estimation of its lightness—it received no application, except as an occasional chemical reagent, until it replaced the expanded air of Montgolfier's fire-balloon, and this remained its chief use until coal-gas became more generally available for aerostatic purposes. In war-time, however, hydrogen, for obvious reasons, was still employed for the inflation of balloons, and much of the development of the technology of hydrogen has resulted from war-time necessities. Many manufacturing processes, in fact, owe their origin entirely to the enormous demand for the hydrogen required to fill kite balloons and airships. The knowledge and experience thus gained are directly available for the ever-growing applications of hydrogen in the chemical arts, as, for example, in the synthesis of ammonia, and in the hardening of oils and fats by catalytic agencies, both of which processes have now become highly important chemical industries. What the future of synthetic ammonia will be remains to be seen. As yet its production has made comparatively little progress in this country, but the "coal question" is bound to affect its prospects, and to what extent, if any, synthetic ammonia will replace by-product ammonia is not wholly clear. On the other hand, the application of M. Sabatier's cardinal discovery of the effect of hydrogen, under the influence of metallic catalysts, in transforming oils and other unsaturated fats into edible products has solved a very pressing problem, which threatened at one time to become acute. It has been the means of adding enormously to the food supply of the world.

Major Teed's monograph consists of five comparatively short chapters. In the first two he gives a concise account of the physical and chemical properties of the gas, the mode of its discovery, the manner of its occurrence in Nature in the free or occluded state, and its reactions with other chemical elements and with certain compounds, particularly with animal and vegetable oils. There is necessarily little of novelty in these chapters; their material is, for the most part, the common property of the text-books. Certain of the physical constants of hydrogen, such as its thermal values, density, solubility in water, transpiration, refractivity, and the relationship between its pressure and volume, are referred to an appendix. These matters are, however, dealt with as briefly as possible; it was doubtless considered necessary to treat them as completing the descriptive history of the subject. The account is generally accurate, and bibliographical references are freely given. We would, however, remark that Sir William Crookes's name is wrongly spelled on p. 7; "Moisson" (p. 19) should be printed "Moissan"; "Neuman" and "Strientz" should be "Neumann" and "Streintz." Moreover, in the table, p. 15, giving the volume of hydrogen adsorbed by finely divided metals, it should be stated that the amounts are *maximum* values; the amounts actually adsorbed are frequently much less in many cases.

The most generally interesting and most valuable section of the work is concerned with the manufacture of hydrogen on the large scale. This is dealt with in the remaining chapters. The processes in use are to some extent affected by local conditions. This is especially true of hydrogen to be used for aviation in war. But when the gas is to be employed for manufacturing purposes, and cost, ease, purity, and uniformity of production are important considerations, war-time methods are not necessarily to be preferred, and as a matter of fact these are seldom or never employed in industry. Manufacturing methods are purely chemical, purely physical, or chemico-physical. The choice of a particular method must depend upon the amount of the gas required, the use to which it is to be put, facility of transport, etc. In certain circumstances it may be better to buy the hydrogen than to make it on the spot. In some established industries, as in the electrolytic production of chlorine and caustic soda, hydrogen is a by-product, and its collection involves little additional cost; hence it can be obtained relatively cheaply. In other cases it may be preferable to establish a plant for its production. This may be electrolytic, or it may depend upon the separation of hydrogen from "blue" water-gas by metallic iron, or by the

Badische Anilin catalytic process, or by the agency of cold and pressure, as in the Linde-Frank-Caro process. All these methods have been carefully worked out, and all are in actual use on the large scale. Major Teed gives a succinct account of them, and of certain other less important processes, with such theoretical explanations as seemed to him necessary. A chemical engineer with actual experience of the working of hydrogen plants will probably find little in the description with which he is not already familiar, but the student and the ordinary chemical manufacturer who are desirous of learning something concerning the mode of producing hydrogen on the large scale for manufacturing purposes will find the book of considerable service. It is simply and concisely written, and well illustrated. The bibliography is fairly full, and the references to patent literature are ample. It would, however, have added to the value of the book as a work of reference if an attempt had been made to give a short analysis of this literature.

ORGANIC READJUSTMENTS.

Man's Supreme Inheritance. Conscious Guidance and Control in Relation to Human Evolution in Civilisation. By F. M. Alexander. Second edition. With an introductory word by Prof. John Dewey. Pp. xxviii + 239. (London: Methuen and Co., Ltd., 1918.) Price 7*s.* 6*d.* net.

THIS book, strongly recommended by Prof. John Dewey, philosopher and educationist, will intrigue the reader. It gives the weary traveller a vista of a promised land, in which he may walk with light steps, and breathe freely, and enjoy physical perfection. The particular path into the promised land is not precisely revealed, but one of the sign-posts is "respiratory re-education," and the general idea is that of substituting for carelessly acquired habits and out-of-date instinctive promptings a regimen—or, rather, an art—of conscious control and scientific guidance. Man is hampered by maladjustments to the complex artificial environment which he has evolved around him; return to Nature and to the simple life is impossible and undesirable; to rely on mystical breezes and emotional gusts to give the ship a prosperous voyage is to invite disappointment; what is needed is more intelligent seamanship.

Human evolution has been environmental as well as organismal, and the changes that are enregistered in the social heritage (city life, for instance) imply much that is unnatural for creatures who are zoologically open-air mammals, much to which the human body is far from being well adapted. To lessen the discomfort and hindrances implied in this imperfect adjustment all sorts of palliatives are tried; the author has faith in none. He believes only in a serious discipline, in conscious control. It is in vain to fall back on deeply rooted subconscious or instinctive promptings, for these were wrought out in relation to a very different order of things, and instead of being dependable guides they may be at times positively misleading. Habits of the body, such as ways of walking and breathing, which once served passably well, have to be superseded by something better, and Mr. Alexander's experience has led him to a large faith in man's educability. Well-thought-out discipline in conscious guidance and control will lead to the development of a new subconsciousness—cultivated, not inherited. The discipline indicated "will enable the individual to stand, sit, walk, breathe, digest, and, in fact, live with the least possible expenditure of vital energy. This will ensure the highest standard of resistance to disease." It is claimed that it will do more (and we can well believe it), that it will develop a new sense of bodily freedom and relief from strain, and that it will react on the inner life of thought, feeling, and will.

This is not the place for any discussion of what Mr. Alexander half reveals of his methods of neuro-muscular training in general, and "respiratory re-education" in particular; we must be content with directing attention to what is a very interesting contribution to the old question of "nature" and "nurture." The central idea is that man's supreme inheritance—to wit, a capacity for rational control—should be more deliberately utilised in the education of the body, in saving us from handicapping habits which artificial conditions all too readily induce, and in leading us to the realisation of powers which, in default of appropriate nurture, are all too likely to remain latent or half-developed. We forgive the author his very frequent repetitions and his frank self-advertisement, for we think that he has something very valuable to say. "We must break the chains which have so long held man to that directive mental plane which belongs to the early stages of his evolution. The adoption of conscious guidance and control (man's supreme inheritance) must follow, and the outcome will be a race of men and women who will outstrip their ancestors in every known sphere, and enter new spheres as yet undreamt of by the great majority of the civilised peoples of our time." This is a large order, but if we begin, Mr. Alexander assures us, we shall soon have abundant payment to account.

OUR BOOKSHELF.

A Geography of America. By T. Alford Smith. (Macmillan's Practical Modern Geographies.) Pp. x + 329. (London: Macmillan and Co., Ltd., 1919.) Price 4*s.* 6*d.*

THE writing of a short text-book is as much an art as the writing of a short story, and little latitude for self-expression can be allowed to those who work for schools. Mr. T. Alford Smith explains this limitation when he appends selected examination questions to his conscientious treatise. The details on which geography is founded still remain more important in the eyes